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AUSTROTYLA, A NEW MILLIPED GENUS
(CHORDEUMIDEA: CONOTYLIDAE: CONOTYLINAE)

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Introduction: The genus *Austrotyla* is proposed for four species formerly included in the genus *Conotyla*: *coloradensis*, *humerosa*, *montivaga*, and *specus*.

Sixteen species have been assigned by various authors (Loomis, 1943; Chamberlin and Hoffman, 1958) to the genus *Conotyla*. The sternal regions of the gonopods of these species have rarely been described, and consequently forms with widely divergent generic characters have been brought together. As now conceived, *Conotyla*, with its junior synonym *Proconotyla* Verhoeff, 1932, is restricted to forms in which the sternum of the anterior gonopods is bandlike; the anterior gonopod is small, simple, inconspicuous, composed of one fused piece, free from its homologue in the coxal region, and it either clutches or entwines about some part of the posterior gonopod; the coxal endite of the posterior gonopod is larger and stouter than the anterior gonopod and sometimes complex on the caudal surface. The characters that quickly distinguish *Austrotyla* from *Conotyla* are the slightly smaller body and the anterior gonopods, which are larger and more conspicuous than the largely membranous coxites of the posterior gonopods. The ranges of these two genera overlap partially in the Middle Western States; species of *Austrotyla* tend to have a wider and more southern and western distribution than species of *Conotyla*. In each genus there are both epigean and troglobitic species.

The form of the sternum of the anterior gonopods of two very incompletely described conotylinid genera, *Cookella*

Chamberlin, 1941, and *Zygotela* Chamberlin, 1951, is not known. With but one exception, the alleged presence of a "small, broadly triangular promentum," the somatic characters of the type species of *Cookella*, *Cleidogona leibergi* Cook and Collins, 1895, closely resemble those of *Austrotyla*. I have not seen the female syntypes, and Chamberlin did not state that he had seen them when he proposed the genus *Cookella*, with the chief diagnostic character the presence of a promentum. I know of no conotyloid with a promentum. The definitive characters of *Zygotela* are unknown, since the type species is based on a larval male.

Acknowledgments: I am grateful to Herbert W. Levi, who loaned the holotype of *Conotyla montivaga* and the large Colorado collection of conotyloids made by him and Mrs. Levi; to H. F. Loomis, who called my attention to some of the discrepancies in the description of *Conotyla coloradensis*; and to each of the following, who also collected specimens that were studied in the preparation of this paper: T. C. Barr, Jr., Richard E. Graham, Oscar Hawksley, C. C. Hoff, and M. W. Sanderson.

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***Austrotyla*, new genus**

Type species: *Conotyla specus* Loomis.

Distribution: Caves and epigeal sites from the upper Mississippi Valley westward to Arizona and northeastern California (Fig. 1).

Diagnosis: Medium size, pigmented (unless troglolitic) conotylinids of 30 body segments in which L-shaped sternites form conspicuous lobes on the ectal margin of the anterior gonopods. Anterior gonopods stouter and more conspicuous than the coxal endites of the posterior gonopods. Nearest *Taiutyla* Chamberlin, 1952, in which the sternites of the anterior gonopods are oval and widely separated but are not ectal to the gonopods.

Description: Body 9 to 21 mm long, 0.9 to 1.7 mm wide, of even width from about segment 4 to segments 20 or 23. Typical body color of preserved specimens: medium to dark brown above and light tan below; metatergites darker than protergites, which often are gray; indistinct tan maculae on the shoulders and the prozonites; a thin middorsal, longitudinal tan suture extends from the middle of the collum through the penult segment; dorsum never with distinct longitudinal brown bands as in *Conotyla*; base of legs light tan; distal half of legs and antennae brown.



FIG. 1. Map showing the distribution of the species and subspecies of *Austrotyla* in the United States. Symbols: square, *A. coloradensis*; dot, *A. humerosa*; open triangle, *A. specus specus*; solid triangle, *A. specus montivaga*; X, females and larvae of undetermined species.

No promentum; the small triangular space between the anterior margin of the mentum and the base of the lingual laminae is covered by a membrane that when wet resembles a sclerite. Ocelli dark brown or black; in *specus* and *coloradensis* there are from 20 to 25 dark brown or black, rarely contiguous ocelli on a brown background arranged in 4 or 5 straight or curved rows in a triangular or subtriangular area with slightly convex sides; one ocellus is out of line on the ectocaudal angle; in the *humerosa* group there are from 7 to 10 brown ocelli, mostly contiguous and arranged in two very irregular horizontal rows on a depigmented background. Antennae very slender and long to slightly clavate and shorter, article 3 longest, and article 4 slightly bent at the base.

Body surface shining; surface of metatergites minutely reticulated and margins minutely beaded; protergites more coarsely reticulated and crossed by one distinct and one indistinct transverse ridge; metapleurites minutely and obliquely striated; a single large submarginal stria crosses the metapleurites obliquely from the ventral margin to the posterior margin.

The width of the collum is slightly more than twice its length, except in *humerosa* where the ratio is 8/5; the anterior margin is semicircular and the posterior margin is either straight or very slightly concave; a weak stria is parallel with the anterior margin. Paranota are on segments 2 through 25 or 26; viewed from above, the ectocephalic margin of typical paranota is rounded and the caudal margin is nearly straight (Fig. 9). The paranota are either well below the dorsal body surface (*specus*,

coloradensis) or even with it (*humerosa*). The segmental setae are acute and set on conspicuous nodules, which on typical segments are arranged as shown in Figure 9; length of longest setae approximately one-third the body width. Shape of caudal segment and arrangement of setae as in *Conotyla*.

Leg pairs 1 and 2, composed of 6 segments, are about two-thirds the length of the following legs; the ventral surface of the tarsal segments bears stiff, dense setae. The other legs are composed of 7 segments. In the male, leg pairs 3 through 7 are slightly shorter and thicker than the postgonopodal legs, and segment 4 of 2 or more of them bears conical or cylindrical lobes on the mesial surface; the size of the lobes is either constant or variable for a species but the arrangement is constant; the tarsal surface of leg pairs 3 through 7 or 11 is pulvillar; leg pair 10 has coxal glands that are seldom everted, and in one species, *specus*, there is an anteriorly directed, nipplelike coxal lobe; leg pair 11 has no coxal glands; segment 3 of leg pair 10 bears a lobe in *humerosa*.

The anterior gonopods curve back over the coxae of the tenth or eleventh legs and are contiguous in the midline, covering the coxal endites of the posterior gonopods. The gonopod is an elongated unsegmented piece smooth on the ventral surface and more or less complex on either the dorsal surface or the mesial margin. It is larger, more heavily sclerotized, and more conspicuous than the coxal endite of the posterior gonopod. At the base, it is separated by a distinct suture from its homologue. The two L-shaped sternites are attached to the ectocephalic angles of the gonopods; the vertical branches of the sternites, which appear as conspicuous lateral lobes that quickly distinguish this genus from any other, are attached either at one point on the ectal margin of the gonopod (*coloradensis*) or all along the basal half of the ectal margin (other species). The spiracle is lateral and difficult to see. The space anterior to the anterior gonopods is filled by a band of transversely striated surface chitin.

The sternum of the posterior gonopods is a weak transverse band; the sternal apodemes are about as long as the coxal endites. The joints between the sternum, coxa, and prefemur are sometimes difficult to see, and it is doubtful whether all of them are movable in any species. The coxosternal joint reaches either to or almost to the midline; a small pore opens on the mesioventral surface of the coxa. The coxal endite arises mainly from the caudal, mesial, and cephalic margins; it is somewhat cuplike and open cephalad or ventrad; it is either entirely membranous or it is partly membranous and partly sclerotized; the shape of the margin varies a little within a species. The second segment, the prefemur, is either markedly clavate (*humerosa*) or only slightly clavate distad (other species). The ovate third segment, the femur, is 2 to 4 times as long as it is thick; it has no terminal spine, but there is usually an irregular brown spot on the apex. The prefemur is either markedly shorter than or slightly longer than the femur.

Classification: *Austrotyla* is diphyletic. The somatic characters of

the *humerosa* group are possibly different enough from the *specus-montivaga* group to warrant the establishment of a separate subgenus. The sternal region of the anterior gonopods is certainly too similar in the two groups to permit generic rank for each.

In addition to the marked specific differences in the anterior gonopods, there are specific differences in the shape of each segment of the posterior gonopods, the size of the body, the size and position of the paranota, the length and thickness of the antennae, the eyes, and the lobation of the legs.

Number of species: Three, of which one is represented by two sub-species; a key is given in the next paragraph. It is possible that *Scoterpes wyandotte* Bollman, 1888, will go in *Austrotyla* also. I have not seen this species, which is still known from only one female specimen (Crawford Co., Indiana, U. S. Nat. Mus., No. 440). The convex posterior margin of the collum and the short body are characters of *Austrotyla* rather than of *Conotyia*, the genus to which Cook and Collins (1895) assigned it. The report of *wyandotte* from Michigan by Johnson (1954, The millipeds of Michigan, Michigan Acad. of Sci., Arts, and Letters, 39: 241-252) needs confirmation.

KEY TO THE GENUS *AUSTROTYLA* BASED ON THE MALE

1. Troglobitic; depigmented; length 17 to 21 mm; 7 to 10 ocelli in an irregular horizontal patch; paranota elevated to the level of the dorsum; lobes on segment 4 of leg pairs 5, 6, and 7. Anterior gonopod: apex attenuated, ending in a hook; with from 4 to many stiff, slender processes on the mesial margin. Posterior gonopod: prefemur clavate distad; length of prefemur and femur almost equal *humerosa* group
- Mostly epigeal and pigmented; length 9 to 17 mm; 19 to 25 ocelli in a triangular patch; paranota placed well below the level of the dorsum; lobes on segment 4 of leg pairs 3 and 4. Anterior gonopod: apex either narrow or broad, rounded; dorsal surface with sclerotized or setose lobes. Posterior gonopod: prefemur very slightly clavate distad; femur markedly longer than prefemur 2
2. Without a lobe on segment 1 of leg pair 10. Anterior gonopod: sternite coalesced to only one point of the ectal margin of the gonopod. Posterior gonopod: coxal endite quadrate from a caudal view; ratio of length to thickness of femur 4/1 ... *coloradensis*
- With an anteriorly directed lobe on segment 1 of leg pair 10. Anterior gonopod: sternite coalesced to the proximal half of the ectal margin of the gonopod. Posterior gonopod: coxal endite triangular from a caudal view; ratio of length to thickness of femur 3/1 3
3. Troglobitic; white to pale brown; length 13 to 15 mm; ratio of the length of articles 3 and 4 of the antennae approximately 4/3 *specus specus*

Epigeal; medium to dark brown; length 9 to 13 mm; ratio of the length of articles 3 and 4 of the antennae approximately $4/2$ ----- *specus montivaga*

Austrotyla coloradensis (Chamberlin, 1910), new combination

Figs. 2-4

Conotyla coloradensis Chamberlin, 1910, Ann. Ent. Soc. Amer., 3(4): 237, Pl. 32, Figs. 8, 9; Pl. 33, Figs. 1-3. Cockerell, 1911, Univ. Colorado Studies, 8: 249. Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 42(7): 382. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 98.

Female holotype (present location unknown) originally stated to be from Colorado was later reported (Cockerell, 1911) as having been collected at Salina, Boulder County, Colorado. A male, collected 4 miles north of Allen's Park, Boulder County, 20 July 1959, by H. W. Levi, has been designated as the neotype (Museum of Comparative Zoology) and described here.

Range: The southern Rocky Mountains of Colorado, including the following counties: Boulder, Chaffee, Eagle, Gilpin (Cockerell, 1927), Gunnison, Hinsdale, and Pitkin.

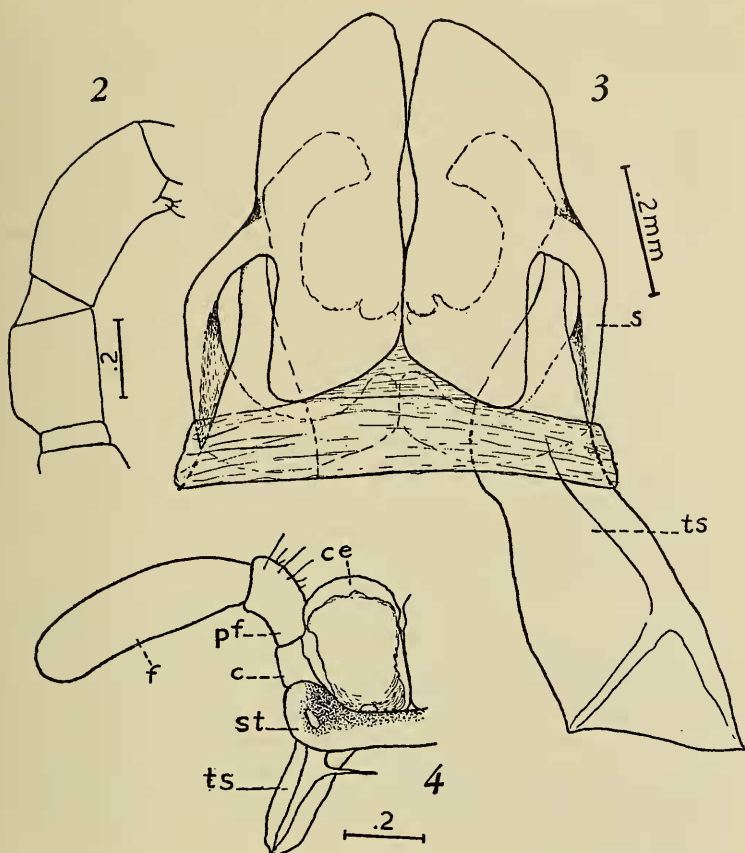
Diagnosis: Nearest *A. specus montivaga*, from which it is easily distinguished by its larger size, the absence of coxal lobes on leg pair 10, and the anterior gonopods, which have the sternites attached at only the middle of the ectal margin instead of all along the basal half of that margin.

Description of the male neotype: Body length about 15 mm, width 1.3 mm. Color and pattern typical of the genus. Ocelli 23; except for the single one on the ectocaudal angle, closely arranged in a triangle which has all sides slightly convex; in curved rows of 1, 7, 6, 5, 3, 1. Antennae slender, approximately 2.3 mm long, ratio of segments 1 through 7 as follows: 9:28:54:34:42:20:13. Gnathochilarium 0.5 mm wide. Segmental setae acute, the longest ones about 0.5 mm long.

Lobation of legs inconspicuous. Distomesial surface of segment 4 of leg pairs 3 and 4 with a small cylindrical lobe, the smallest in the genus. Ventral surface of tarsal segment of leg pairs 3 through 7 pulvillar.

In ventral view, the anterior gonopods are slightly contiguous along their mesial margin; they curve caudad at the base but straighten out distad; they reach back to the coxae of leg pair 10. From a caudal view, the coxal endites of the posterior gonopods appear as two membranous, quadrate, convex, closely contiguous pieces that cover the complex basal region of the dorsal surface of the anterior gonopods.

A transversely striated band of chitin crosses the ventral surface at the base of the anterior gonopods. The 2 L-shaped sternites together form an irregular, U-shaped support at the sides and across the dorsal surface at the base of the anterior gonopods. The end of the vertical arm of the sternite, carrying the tracheal pouch, is firmly coalesced



FIGS. 2-4. *Austrotyla coloradensis* (Elk Mts., Gunnison Co., Colorado). Fig. 2.—Segments 2 to 4 of third leg of male. Fig. 3.—Anterior gonopods, ventral view. Fig. 4.—Left posterior gonopod, anterior view. Abbreviations: c, coxa; ce, coxal endite; f, femur; pf, prefemur; s, sternite; st, sternum; ts, tracheal pouch.

to the middle of the ectal margin of the gonopod; the opening between the lateral sternal arm, the tracheal pouch, and the ectal margin of the gonopod easily distinguished this species from the others in which the gonopod and the vertical arm of the sternite are coalesced longitudinally. The horizontal arm of the sternite is coalesced to its homologue in the middorsal line. The anterior gonopods (Fig. 3) are smooth on the ventral surface and narrowly rounded at the apex; on the middle of their dorsal surface is a conspicuous, rounded, heavily chitinized lobe and at the base is a transverse shaggy region. I have not seen the spiracles.

The coxosternal joint of the posterior gonopods reaches to the mid-line of the sternum and is easily seen. From a caudal view, the coxa is about the length of the prefemur; from a cephalic view, the prefemur is longer. The membranous coxite is in the form of a large subquadrate shallow cup that opens cephalad; thin membranes of nearly equal length form the mesial, ventral, and ectal sides of the cup; the mesial margin is irregularly serrated and the ventral margin has one shallow emargination. The prefemur is very slightly clavate distad. The femur is the slenderest in the genus; the ratio of its length to its width is approximately 4/1. The ratio of the length of the prefemur and femur is approximately 2/5.

Figures 2 to 4 were drawn from a male from the Elk Mountains, below Queen Basin, Copper Creek Valley, Gunnison County, Colorado. It differs slightly from the neotype in the shape of the margin of the coxal endite.

Variations: The length varies between 14 and 17 mm. The number of ocelli varies between 23 and 19; the usual number is 22 or 23; when the number is reduced, the loss is in the shorter rows. The shape, position, and size of the lobes of the legs of the male have not been observed to vary significantly. The margins of the coxite of the posterior gonopod show some minute individual variations.

Remarks: The description of *Conotyla coloradensis* Chamberlin, 1910, was based on a female, now lost. Only one other Colorado conotyloid has been reported (see the paragraph on *Austrotyla* spp.). My decision to identify this species as the problematical Chamberlin species was made with the full awareness that there are several discrepancies between it and the original description. I made the determination after learning: (1) that this is the most common conotyloid in Colorado, and, therefore, the chances are great that it is the one that was described, and (2) that the original description contains errors. The discrepancies between the description of the holotype and my specimens are listed and discussed below:

1) Length of antennae. The only measurement of the holotype is of the antennae, which were stated to be "very long," 4.2 mm. The drawing of an antenna (Chamberlin, op. cit., Pl. 33, Fig. 2) does not suggest unusual length, however; the proportions are essentially what I have found, allowing for slight errors in copying and variations in specimens. In my specimens the antennae are between 2.2 and 2.4 mm long, about five times the width of the gnathochilarium.

The drawings of the gnathochilarium and an antenna of the holotype were stated to have been enlarged 39.5 and 87 times, respectively (Chamberlin, op. cit., p. 260 and Pl. 33, Figs. 1 and 2). If one reduces these drawings accordingly, then the gnathochilarium of the holotype is about 1 mm wide and the antennae about 1.2 mm long. Since such short antennae are not found on any conotyloid with a gnathochilarium of that width, an error in the statement of the degree of enlargement is indicated. If it is assumed (1) that the scales of enlargement of these

two drawings really refer to enlargement before publication and (2) that the figures were inadvertently interchanged, then the relative sizes of the gnathochilarium and the antennae of the holotype are approximately what I have reported.

The body length of the holotype was not recorded. Loomis (1943), who stated that the length is over 22 mm, reached this figure by deduction (personal letter to Nell B. Causey, 25 Nov. 1960), basing it on Chamberlin's statement that the antennae of the holotype were 4.2 mm long.

2) Gnathochilarium. The gnathochilarium of the holotype was represented (Chamberlin, op. cit., Pl. 33, Fig. 1) as having a minute promentum. The minute triangular space anterior to the mentum does not contain a sclerite.

3) Eyes. One eye of the holotype was drawn (Chamberlin, op. cit., Pl. 32, Fig. 9). The eyes of my specimens differ in that there is an additional ocellus on the ectocaudal angle. It is smaller than the ocelli in the caudal row and easily overlooked.

4) Position of segmental setae. The position of the internal segmental setae of the holotype was described as follows: "Innermost bristle about one-third the distance from median to the edge of the carina of the corresponding side. . . ." (op. cit., p. 237). In my specimens the internal setae of typical body segments are approximately two-thirds the distance from the median to the lateral edge of the body.

Distribution: The Herbert W. Levis made 28 collections of *A. coloradensis*, including 32 mature males and 21 mature females, in 5 Colorado counties between 1952 and 1960. Adults and larvae of both sexes were collected in each of the months of June, July, and August. The collection sites are at altitudes between 3,300 feet and 13,000 feet. Of the 22 collections with habitat data, 3 were made in meadows, 3 in talus, 2 in mixed forests, and 14 in coniferous forests. The specimens that were examined are in the Museum of Comparative Zoology; they are listed below:

BOULDER COUNTY: 4 miles N of Allen's Park, 1 ♂ (neotype). CHAFFEE COUNTY: Monarch Pass, 3 ♂, 2 ♀. EAGLE COUNTY: Gore Mts., 1 ♂. GUNNASON COUNTY: Gothic, 5 ♂, 1 ♀; N slope of Ohio Peak, 2 ♂; Castle Pass, 3 ♂, 2 ♀; Copper Creek Valley, 7 ♂, 5 ♀; 5 miles E of Wuanita Hot Springs, 1 ♂, 1 ♀; Fossil Ridge, 3 ♂, 1 ♀; Cumberland Pass, 1 ♂; Schofield Pass, 1 ♂, 2 ♀; Tincup, 1 ♀; Washington Gulch, 1 ♀. Gunnison-Pitkin County line: Conundrum Pass, 2 ♂, 2 ♀. HINSDALE COUNTY: Slumgullion Pass, 3 ♂, 2 ♀. PITKIN COUNTY: Buckskin Pass, 1 ♀.

With the exception of 2 specimens and the usual run of larvae (from all of the counties listed above and San Miguel County) unidentifiable as to species, all of the chordeumids collected at 30 sites in 7 Colorado counties by the Levis and C. C. Hoff are *C. coloradensis*. One of the exceptions is a female austrotylid from Conejos County. The other is a larva of uncertain generic position from Pitkin County. The Levis'

collections from the following Colorado counties contain no chordeumids: El Paso, Montrose, Rio Grande, and Saugache.

Austrotyla humerosa (Loomis), new combination

Conotyla humerosa Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 92(7): 384-385, Figs. 5a-d. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Male holotype (U. S. Nat. Mus. No. 1443) collected in Sunnyside Mine, 3 miles southwest of Seneca, Plumas County, California, 22 Jan. 1923, by H. S. Barber.

Range: Known only from the type locality.

Diagnosis: Distinguished by the very high paranota, the reduced number of ocelli, the absence of body pigment, and the attenuated anterior gonopods with 4 or 5 unequal processes on the mesial margin.

The anterior view of the left anterior gonopod that was drawn by Loomis (op. cit., Fig. 5b) clearly shows the vertical lobe of the sternite ectal to the anterior gonopod and establishes the generic position of this species. From a ventral view, the anterior gonopods, broad at the base and narrowed distad, simulate the appearance of the anterior gonopods of trichopetalinids.

A correction of the original description must be made: there is no promontum.

Ecological status: The species is surely a troglobiont that has moved from cave passageways, of which there are many in this limestone area, into the connecting shafts of Sunnyside Mine.

Material examined: Larval male paratype (Museum of Comparative Zoology).

The *humerosa* Group

The *humerosa* group of this genus will be treated in a later paper. They occur in limestone and lava caves of northeastern California and are the only troglobitic conotylinids that have been collected west of the Rocky Mountains. They are much more highly modified by their cave life than the eastern conotylinids, *Austrotyla specus specus*, *Conotyla bollmani*, and *Conotyla vaga*, all of which have very close epigean relatives and are probably relatively recent cavernicoles.

Austrotyla specus (Loomis), new combination

Austrotyla specus, the most widely distributed species of the genus, is easily distinguished from the other species by the anteriorly directed coxal lobes of the tenth legs of the male. The form of both pairs of gonopods indicates that it is more closely related to *coloradensis* than to *humerosa*. Specimens of both sexes and later larval stages are readily distinguished from *Conotyla pectinata*, with which it is sympatric in the Middle West, by the longer segmental setae and the smaller body.

I recognized two subspecies of *specus*. Their relationship to two other

closely related forms in northern New Mexico cannot be determined until more material is available. The nominate subspecies is probably an obligate cavernicole in eastern Missouri and western Illinois; *s. montivaga* is epigean, with a disjunct distribution that presents the greatest problem in this genus; I have identified it from several sites along the upper Mississippi River and Loomis identified it from three sites in the Southwest. The two subspecies have identical gonopods. The lobation of the legs shows a little variation in the size of the lobes, none in position; a conical or slender cylindrical lobe is on the mesial surface of segment 4 of leg pairs 3 and 4.

The differences between *s. specus* and *s. montivaga* are the unspectacular kinds of modifications produced in millipeds by cave life. In *s. specus* there is reduction of body pigment, a slight enlargement of the body, and a slight elongation of the antennae and legs. That *s. specus* is a relatively recent troglobite is indicated by the presence of almost as many ocelli as in *s. montivaga*.

Austrotyla specus specus (Loomis), new combination

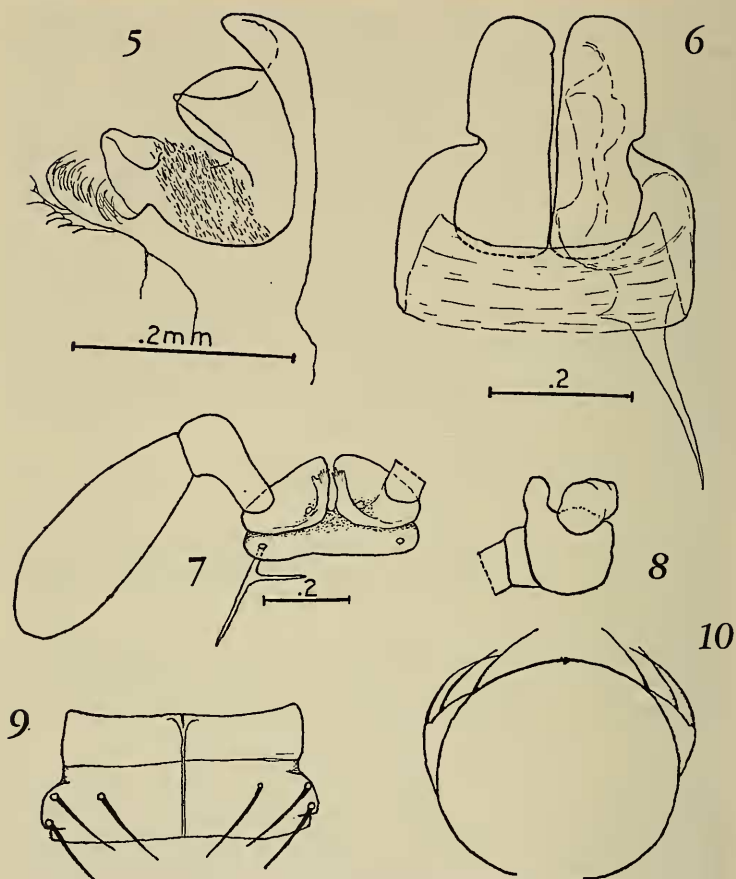
Figs. 5-10

Conotyla specus Loomis, 1939, Bull. Mus. Comp. Zool. Harvard, 86(4): 184, Fig. 11a-c; 1943, *ibid.*, 92(7): 382. Hubricht, 1950, Nat. Speleological Soc. Bull., 12: 17. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Nomenclatorial summary: The name *specus* was first applied (Loomis, 1939) to a form collected in two eastern Missouri caves. Later (Loomis, 1943; Hoffman in Hubricht, 1950) it was applied to collections from other caves in eastern Missouri and adjacent southwestern Illinois and to an epigean collection (Causey, 1952) from northern Illinois. The epigean form is recognized here as *s. montivaga*. The populations in the caves in the vicinity of the confluence of the Missouri and Mississippi rivers, *s. specus*, are unevenly modified by cave life. Of the specimens that I have seen, those from Meramec Caverns, Jefferson County, Missouri, show the greatest modification, and those from Eckert's Cave, Monroe County, Illinois, show the least; the latter, since they are smaller and more deeply pigmented, might be regarded as intergrades between *s. specus* and *s. montivaga*; the antennae are of the *s. specus* type. It is possible that some of the differences in color and size of the specimens in these cave collections are artifacts produced by the variations in strength and composition of the preservatives.

Male holotype (Museum of Comparative Zoology) collected in Rice's Cave, 3 miles northeast of Goldman, Jefferson County, Missouri, 16 October 1938, by Leslie Hubricht.

Range: Reported from caves in Franklin, Jefferson, and St. Louis counties, Missouri, and St. Clair and Monroe counties, Illinois. These records include possible intergrades with *s. montivaga* in southwestern Illinois.



FIGS. 5-10. *Austrotyla specus specus* (Meramec Caverns, Jefferson Co., Missouri). Fig. 5.—Right anterior gonopod, mesial view. Fig. 6.—Anterior gonopods, ventral view. Fig. 7.—Posterior gonopods, anterior view. Fig. 8.—Segments 1 and 2 of third leg of male. Fig. 9.—Outline of segment 10, dorsal view. Fig. 10.—Outline of segment 10, posterior view. Figs. 8-10 are drawn to the same scale.

Diagnosis: Differs from *s. montivaga* in the cave habitat, the reduction of body pigment, the larger body, and the difference in the length of the articles of the antennae, of which the ratio of articles 3 and 4 is approximately 4/3.

Description of a male from Meramec Caverns: Body length about 14 mm, width 1.3 mm, legs 1.7 mm long. In alcohol flesh colored; in life probably colorless. Ocelli arranged in a subtriangular area with the

ocelli almost touching, the two caudal rows straight except for the single ocellus on the ectocaudal angle, and the other rows uneven; 21 ocelli in rows of 1, 7, 6, 5, 2; the outer halves of the ocelli in the shortest and longest rows are depigmented, giving the eyes a subtriangular appearance. Length of antennae 2.3 mm; the ratio of segments 1 through 7 as follows: 8:24:48:33:29:24:12. Segmental setae acute, conspicuous, and up to 0.5 mm long. Middle of mesial surface of segment 4 of leg pairs 3 and 4 with a slender, conical lobe; the lobes are slightly unequal, with the one on leg pair 4 larger. Ventral surface of tarsal segment of leg pairs 3 through 7 pulvillar. Coxal segment of leg pair 10 (Fig. 8) with the gland everted; on the distal margin of the coxa is an anteriorly directed lobe, slightly constricted at the base, that is contiguous with the mesial surface of the prefemur of the posterior gonopods.

From a ventral view, the anterior gonopods (Fig. 6) are as broad and rounded at the apex as at the base; there is a small concavity on the middle of the ectal margin at the apex of the sternites which are fused to the ectal margin. Dorsad, the sternites are connected by two narrow arcs that are contiguous in the mid-dorsal line at the base of the gonopods. The apodemes are about the length of the gonopods. The figure of the ventral surface of the anterior gonopods (Fig. 6) shows the right one as it appears after maceration, with the thicker elements on the dorsal surface showing through. The details of the dorsal surface (Fig. 5) are most easily seen from a mesial view. Proceeding from the apex to the base are the following elements: two contiguous flattened lobes, one rounded and the other angular, a rounded lobe covered with short setae, a larger membranous lobe, and a longer narrow lobe that is covered distad with long setae.

From a caudal view of the posterior gonopods, the coxal endites have the appearance of two convex, membranous, triangular pieces that are almost contiguous along their shorter margin. The coxae reach almost to the midline of the sternum, and the sutures between them and the sternum and the prefemurs are easily seen. The coxa, as measured along the ectal surface, is about one-fifth the length of the prefemur. A minute pore is on the mesioventral surface of the coxa adjacent to the mesial lobe of the coxal endite. The coxal endite consists of two lobes; the larger one is membranous, triangular, arises from the mesiocaudal margin of the coxa, the apex reaches to the middle of the length of the prefemur, and its even margins are turned cephalad; the smaller mesial lobe is stiffer and columnar, and distad it is expanded, striated, and contiguous with its homologue. The prefemur is slightly clavate distad. The femur is a little thicker than in *coloradensis*; the ratio of its width to its length is approximately 2/5. The ratio of the length of the prefemur to the length of the femur is also about 2/5.

Variations: Body length 12 to 15 mm. In alcohol colorless to pale brown. Ocelli 20 to 24. Length of antennae 1.8 to 2.3 mm.

Specimens examined: ILLINOIS: MONROE COUNTY: Eckert's Cave, near Burksville, 1 ♂, 24 January 1947. MISSOURI: FRANKLIN COUNTY:

Copper Hollow Sink Cave, 1 ♂, 1 ♀, 8 February 1958. Meramec Caverns, 1 ♂, 2 ♀, 20 December 1957. Fisher Cave, 1 ♀, 8 February 1958. Mushroom Cave, 1 ♂, 8 February 1958.

Austrotyla specus montivaga (Loomis), new status, new combination
Conotyla montivaga Loomis, 1943, Bull. Mus. Comp. Zool. Harvard, 92(7): 383-384, Fig. 4a-d. Chamberlin and Hoffman, 1958, U. S. Nat. Mus. Bull., 212: 99.

Conotyla specus Causey, 1952, Proc. Biol. Soc. Washington, 65: 113.

Male holotype (Museum of Comparative Zoology) collected at 7,500 feet elevation in the Santa Rita Mts., Pima County or Santa Cruz County, Arizona, 29 October 1927, by H. F. Loomis.

Range: Southern New Mexico, southern Arizona (Loomis, 1943), northern Illinois, and southern Wisconsin.

Diagnosis: Distinguished from *s. specus* by the epigeal habitat, the smaller, more deeply pigmented body, and differences in the length of the articles of the antennae, of which the ratio of articles 3 and 4 is approximately 2/1.

Description (paraphrased from Loomis' description based on an unspecified number of specimens): Body length 9 to 13 mm; pigmentation weak; ocelli 21, in 4 or 5 series arranged in a subtriangular group, 3, 5, 6, 7 or 1, 3, 5, 6, 6; antennae rather short and stout; paranota not becoming apparent until the fourth or fifth segment and completely lacking from the last half dozen segments; males with a long slender lobe on the middle of the ventral surface of segment 4 of leg pairs 3 and 4; ventral surface of tarsal segment of leg pairs 3 to 7 granular; anterior surface of coxal segment of leg pair 10 with a knoblike lobe that projects under the gonopods; "both anterior and posterior gonopods show the close relationship to *specus* although they exhibit obvious differences."

I have made the following observations from the male holotype: body length about 9 mm, body thickness 1 mm; no promontum; length of antennae approximately 1.8 mm, the ratio of segments 1 through 7 as follows: 9:22:47:20:32:18:9; the ocelli were not recounted; small cylindrical lobes, approximately twice as long as they are thick, are on the middle of the mesial surface of leg pairs 3 and 4; the ventral surface of leg pairs 3 through 11 is pulvillar; the length of the longest segmental setae, most of which have been rubbed off, is 0.35 mm; the details of both pairs of gonopods, including the complex dorsal surface of the anterior pair, are as in *s. specus* (Figs. 5-7).

Variation: The length of the specimens that I have seen is between 9 and 10 mm. There are 23 or 24 ocelli in rows of 1, 7, 6, 5, 4(3), 1. The antennae are from 1.3 to 1.8 mm long. The lobes on segment 4 of leg pairs 3 and 4 are thick and conical in the Illinois specimens and slender and cylindrical in the Wisconsin specimens; no marked differences were observed between the size of the lobes on leg pairs 3 and 4 in any one male. The segmental setae are from 0.3 to 0.5 mm long. The shape of the margins of the lobes on the dorsal surface of the anterior

gonopods varies minutely from *s. specus*; the variation is possibly of an individual or a clinal nature.

Specimens examined: ARIZONA: Santa Rita Mts., male holotype. ILLINOIS: CARROLL COUNTY: Smith Park, Mt. Carroll, 2 ♂, 1 ♀, 6 December 1945; Pallasades State Park, 1 ♂, 6 December 1945. WISCONSIN: SAUK COUNTY: Devil's Lake State Park, in pine litter on east bluff, 2 ♂, 13 October 1955. VERNON COUNTY: (tentative determinations) 1 mile east of Coon Valley, in oak litter, larvae, 2 September 1954; 5 miles north of Viola, in mixed hardwood litter, larvae, 2 September 1954.

Austrotyla spp.

Specimens undetermined as to species, all collected by C. C. Hoff, have been examined from the following sites: COLORADO: CONEJOS COUNTY: Cumbres Pass, 10,000 feet alt., 1 ♀, 3 September 1952. NEW MEXICO: SANDOVAL COUNTY: 12 miles E of Cuba, 8,800 feet alt., in deep, moist Gambel oak litter in yellow pine zone, 1 ♀, larvae, 26 August 1953. SANTA FE COUNTY: Baldy Mt., 11,400 feet alt., larvae, 11 August 1953. TAOS COUNTY: Mt. Wheeler trail, S of Red River Village, 10,300 feet alt., larvae, 8 September 1953.

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